Team Asteria

Preliminary Design Review

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**Mission Overview**

**UV**
- Objective: To determine changes in UV over time
- Hypothesis: More intense with altitude
- UV-b and UV-c as compared to UV-a
- Compare to NOAA ground stations’ data
  - Looking for variances

**VLF**
- Objective: To collect, and analyze radio waves from cosmic phenomena
- Hypothesis: Expect to collect solar flare data as VLF waves
- Collecting from the Very Low Frequency range: 3kHz - 30kHz
- Unique form of documentation
Design: Concept of Operations

- **Pre-Launch:**
  - Assembly of structure and subsystems
  - Testing

- **Launch:**
  - All subsystems switched on
  - Structure and doors sealed with aluminum tape

- **Drop:**
  - BalloonSat recovered
  - Seals broken
  - All switches turned off

- **Flight:**
  - Collecting data over entire flight
  - Humidity, pressure, temperature sensors, and accelerometers gathering environmental data
  - Antennae and UV sensors collecting science data

- **Data Analysis:**
  - Data from SD cards transferred to team computers
Design: Drawing/Models
Design: FBD

**THERMAL**
- Power 3.9V Batteries
- Switch
- Heater
- LED Indicator

**CORE**
- Power 2.9V Batteries
- Switch
- Arduino CORE
- LED Indicator
- 2G SD Card
- Temperature Sensor Interior
- Temperature Sensor Exterior
- Pressure Sensor
- Humidity Sensor
- Accelerometer

**SCIENCE**
- Power 2.9V Batteries
- Switch
- Arduino SCI
- 4 UV Ray Sensors
- 3.5mm Input Jack
- Amplifier
- Antenna Circuit
- Power 1.9V Battery
- LED Indicator
- 8G SD Card
- 2 Radio Wave Antennae

**CAMERA**
- Power 1 Lithium-ion Battery
- Camera
- 4G SD Card
Design: Test Plan - Structural Tests

- Drop test
- Stair test
- Whip test
- Thermal test

Structural tests are being conducted in order to verify the structural integrity of the BalloonSat.
Design: Test Plan (cont.) - Sensor Tests

- UV sensors
- Radio telescope
- Accelerometer
- Pressure sensor
- Humidity sensor
- Temperature sensors
- Camera

Sensor tests are being conducted in order to:
1. Confirm sensor function
2. Calibrate sensors in order to collect correct data
Design: Test Plan (cont.) - Full System Test

After all components of the satellite have been finalized:

- turn on every function for at least 3 hours
- ensure that all components of the satellite are working properly
- all functions must remain operational and record data correctly throughout the entire duration of the test

The team will not proceed until this test is successful.
Expected VLF Data
Expected UV Data

- UVa
- UVb
- UVc

Altitude (km) vs. Ozone (DU/km)
Expected External Temperature Data

Expected Internal Temperature Data

Temperature versus altitude within Earth’s atmosphere

Source: National Oceanic and Atmospheric Administration (NOAA)
Expected Accelerometer Data

X-Axis Acceleration

Z-Axis Acceleration
Biggest Worries

- Antenna circuit failure.
- Power concerns
Appendix: Weight Summary
The team has a limit of 1000 g.

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<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Weight (g)</th>
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<td>Foam Core and Insulation</td>
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**Total:** 957 g
Appendix: Budget Summary
The team has a limit of $225.

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<td>Heater</td>
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<td>Camera</td>
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**Total:** $127.75
## Appendix: Schedule
### March-May

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<tr>
<th>Date</th>
<th>Task</th>
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<tr>
<td>Mar 21-29</td>
<td>Spring Break</td>
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<td>Tue. Mar 1</td>
<td>HW 09 Due, Mission Simulation Test</td>
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<tr>
<td>Wed. Apr 1</td>
<td>Final Satellite Construction Begins, Begin LRR Presentations</td>
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<tr>
<td>Mon. Apr 2</td>
<td>Finalize LRR Presentation and Finish Satellite</td>
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<tr>
<td>Tue. Apr 3</td>
<td>LRR Presentations Due -7:00 AM</td>
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<tr>
<td>Wed. Apr 4</td>
<td>Examine Satellite, Test Radio, and UV Data Again</td>
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<td>Fri. Apr 5</td>
<td>Final Balloon weigh in</td>
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<td>Sat. Apr 6</td>
<td>LAUNCH DAY</td>
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<tr>
<td>Mon. Apr 7</td>
<td>Begin Post Launch Data Analysis, Begin Post Launch Presentation</td>
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<td>Tue. Apr 8</td>
<td>Convert Radio Waves To Audio</td>
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